

MHI
Copy 3

FM 55-26

DEPARTMENT OF THE ARMY FIELD MANUAL

TRANSPORTATION INLAND WATERWAYS SERVICE

The Sixth Army Library
Library Depot, Bldg M 13-14
Presidio of San Francisco, Calif.
Property of U. S. Army

DEPARTMENT OF THE ARMY • MARCH 1953

TRANSPORTATION
INLAND WATERWAYS
SERVICE



DEPARTMENT OF THE ARMY • MARCH 1953

United States Government Printing Office
Washington : 1953

DEPARTMENT OF THE ARMY
WASHINGTON 25, D. C., 31 March 1953

FM 55-26 is published for the information and guidance of all concerned.

[AG 353 (16 Jan 53)]

BY ORDER OF THE SECRETARY OF THE ARMY:

OFFICIAL:

WM. E. BERGIN
Major General, USA
The Adjutant General

J. LAWTON COLLINS
Chief of Staff
United States Army

DISTRIBUTION:

Active Army:

Tech Svc (1); Tech Svc Bd (2); AFF (5); AA Comd (3); OS Maj Comd (5); Sec (3); Base Comd (3); MDW (3); Log Comd (3); A (3); CHQ (3); FT (1); Sch (2) except 55 (200); Tng Div (3); POE (10), OSD (2); Mil Dist (3); T/O & E's, 55-9 (2); 55-37 (2); 55-68 (2); 55-111 (5); 55-115 (5); 55-118 (2); 55-121 (5); 55-500A, AA-AE, FA-FM, IA-IF, JA-JI, LA-LF (1); 55-515 (10); 55-555 (10).

NG: Same as Active Army except one copy to each unit.

Army Reserve: Same as Active Army except one copy to each unit.

For explanation of distribution formula, see SR 310-90-1.

CONTENTS

	<i>Para- graphs</i>	<i>Page</i>
CHAPTER 1. INTRODUCTION		
<i>Section I.</i> General	1-3	1
<i>II.</i> Inland waterways	4, 5	2
<i>III.</i> Inland waterway craft	6-8	3
<i>IV.</i> Capabilities and limitations of waterways	9, 10	5
CHAPTER 2. TRANSPORTATION INLAND WATERWAYS SERVICE		
<i>Section I.</i> Organization	11-13	7
<i>II.</i> Relations with other services ..	14, 15	8
CHAPTER 3. PLANNING		
<i>Section I.</i> Advance planning	16-21	10
<i>II.</i> Computation of waterway capacity	22-26	13
CHAPTER 4. ORGANIZATION OF MILI- TARY AND INDIGENOUS PERSONNEL	27-31	20
5. OPERATIONS		
<i>Section I.</i> Operating divisions	32, 33	29
<i>II.</i> Communications and dispatch- ing	34-37	32
<i>III.</i> Piloting	38-43	35
<i>IV.</i> Special operations	44-46	43
<i>V.</i> Rigging of tows	47-53	45
CHAPTER 6. TERMINALS		
<i>Section I.</i> General	54, 55	48
<i>II.</i> General cargo terminals	56-58	49
<i>III.</i> Bulk liquid terminals	59-61	50
<i>IV.</i> Terminals handling bulk solids ..	62-64	52
<i>V.</i> Mechanical handling equip- ment	65, 66	53
TAGO 3043C 200491°—53—2		iii

	<i>Para- graphs</i>	<i>Page</i>
CHAPTER 7. MAINTENANCE, REPORTS AND RECORDS, AND SAFETY		
<i>Section I.</i> Maintenance	67-69	54
<i>II.</i> Reports and records	70, 71	56
<i>III.</i> Safety	72-74	56
APPENDIX REFERENCES		58
INDEX		60

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Purpose

The purpose of this manual is to provide military personnel with basic doctrine relative to the techniques of operating an inland waterways service and to set forth the capabilities of inland waterway transportation.

2. Scope

This manual describes the organization, utilization, and operation of inland waterways systems in theaters of operation. To transportation planners it presents the capabilities and characteristics of this mode of transportation so that they may free faster modes of transport for movement of high priority cargoes. To military personnel who operate or supervise the operation of an inland waterways service it serves as a guide in day-to-day operations by presenting operating principles which conform to methods employed by commercial operators.

3. Mission

a. The mission of an inland waterways service is to provide inland waterway transportation service for the armed forces.

b. An inland waterways service is formed to control and operate a waterway system, to formulate and coordinate plans for the utilization of inland waterway transport resources, and to provide for the integration and supervision of such indigenous facilities as are used in the support of military operations.

Section II. INLAND WATERWAYS

4. Definition

In general, inland waterways include all rivers, inland lakes, inland channels, and canals of sufficient depth to accomodate inland waterway traffic. Military inland waterways are defined as those inland waterways in theaters of operations which are under military control.

5. Types of Inland Waterways

a. Inland waterways are grouped into the following general types:

- (1) Inland lakes and land-locked seas such as the Great Lakes of North America and the Caspian Sea.
- (2) Riverways such as the Nile, Amazon, Mississippi, Rhine, Brahmaputra, Yangtze, and Volga Rivers.
- (3) Ship canals such as the Panama, Manchester, and Suez Canals.
- (4) Barge canals such as the Albert, Moscow-Volga, and New York State barge canals.
- (5) Intracoastal waterways (waterways usually running parallel to the coast line of a

land mass and sheltered enough to permit the navigation of small vessels thereon) such as the Gulf Intracoastal Waterways running parallel to the Gulf of Mexico coast line between Florida and Texas, and the Inland Passage from the Pacific northwest to Alaska.

b. To further differentiate between the various types of inland waterways three basic military classifications have been established.

- (1) *Very shallow*. Very shallow waterways are those whose depths are less than 4½ feet.
- (2) *Medium*. Medium waterways are those whose depths are between 4½ and 7 feet.
- (3) *Deep*. Deep waterways are those having depths greater than 7 feet.

Section III. INLAND WATERWAY CRAFT

6. Definition

Inland waterway craft are those characterized by shallow draft, good maneuvering characteristics, and minimum clearance.

7. Description

a. Inland waterway craft are self-propelled or towed, with or without cargo-carrying capability. Those possessing cargo-carrying capability can further be classified as follows:

- (1) *Deck-loaded*. Deck-loaded vessels are those vessels with cargo on, not below, their decks.

- (2) *Hold-loaded.* Hold-loaded vessels are those vessels carrying cargo below deck or in holds.
- (3) *Tank vessels.* Tank vessels are those vessels capable of transporting bulk liquid cargo.

b. Tugs of 400 to 500 horsepower require in excess of 6-foot depth waterways while tugs of 650 horsepower or greater require in excess of 8½-foot depth waterways. River towboats are generally designed to meet draft limitations of waterways on which they will be operated.

c. The inland waterway fleet of the Transportation Corps is divided into three draft classifications which correspond with the basic classifications of waterways (par. 5b).

8. Types of Harbor Craft Suitable for Use on Inland Waterways

In addition to inland waterway vessels, the following harbor craft vessels can be used on deep inland waterways.

a. *Barges and Lighters, Self-propelled and Non-propelled.* These are to move dry, liquid, and refrigerated cargoes.

b. *Tugs.* Tugs also termed towboats, are used for moving nonpropelled equipment on inland waterways deep enough for their drafts.

c. *Utility Boats.* These carry limited amounts of light cargo either on deck or below deck.

d. Personnel Boats. Personnel boats are used for command and inspection purposes as well as for small movements of personnel.

e. Floating Cranes. These are used in the loading and unloading of heavy lift cargo to augment or replace cargo handling equipment aboard vessels.

f. Miscellaneous Vessels. In addition to the harbor craft mentioned above, the Transportation Corps marine fleet has landing craft, pier barges of steel construction, floating machine shops, floating dry-docks, and training vessels.

Section IV. CAPABILITIES AND LIMITATIONS OF WATERWAYS

9. Capabilities

a. Inland waterway transportation in its modern form operated by modern techniques is equal in importance to the modes of rail, highway, air, and pipe line.

b. Inland waterways in both developed and undeveloped areas play an important role in the movement of supplies in support of the civilian economy or of a military operation.

c. In liberated areas, waterways can be used to move the large amount of supplies necessary for rehabilitation of civilian populations with a minimum of interference to military operations.

d. Waterway transportation ranks second in importance as an economic means of movement of bulk supplies. In addition, bulky or heavy items not easily transported by other means may be moved over water.

10. Limitations

a. Waterways are extremely vulnerable to climatic changes. During the winter in the northern latitudes they are subject to freezing with the resultant immobilization of all traffic unless icebreaking operations are undertaken. Floods and droughts may also influence the ability of a waterway to support a mission.

b. Waterways are inflexible. Although canals have been dug to link other bodies of water, this is not feasible in military operations. The man-made features, locks, bridges, cuts, and dams along a waterway are vulnerable to destruction with resultant temporary blocking of the waterway.

c. While the waterway is an extremely economical means of transport, it is also slow compared to other modes available. In planning, these factors must be carefully weighed to determine the feasibility as well as the economy of utilizing this mode of transportation.

CHAPTER 2

TRANSPORTATION INLAND WATERWAYS SERVICE

Section I. ORGANIZATION

11. Department of the Army

Within the Department of the Army, The Chief of Transportation is primarily responsible for transportation by inland waterways including—

a. Development of plans and establishment of policies for effective utilization of inland waterway facilities within the continental United States (for all purposes other than commercial traffic).

b. Formulation of strategic plans for use of over-sea inland waterways.

c. Recommendation of doctrines and procedures concerning Transportation Corps personnel and equipment operating in world-wide inland waterway activities.

d. Recommendation of research and development projects for improved floating equipment to be used in inland waterway systems.

e. Maintenance of liaison with the Chief of Engineers, the Department of Defense, and other Government agencies on matters pertaining to inland waterway transportation in which these agencies have an interest.

12. Theater of Operations

The primary function of the Transportation Corps in a theater of operations is to move persons and things for the military forces and to fulfill those civilian transportation requirements which are the responsibility of the theater commander. The theater commander normally delegates the responsibility for the inland waterways service to the communications zone commander. This service functions under military control and supervision at all times, even though it may be operated by indigenous personnel using local equipment.

13. Communications Zone Headquarters and Lower Echelons

At a communications zone headquarters where a transportation officer is on the special staff, his organization may include an inland waterway section. The operating units of the inland waterways service are under the staff supervision and operational control of the transportation officer.

Section II. RELATIONS WITH OTHER SERVICES

14. Other Transportation Services

a. The objective of movement control is to make certain that personnel and supplies are moved when required, in the quantities required, and between origins and destinations as required to support military operations. The inland waterways service is responsible to the transportation officer of the command,

within the limits prescribed by the commander, for the operation of equipment and facilities required to assist in attaining this objective. For detailed information concerning movement control refer to FM 55-10.

b. Since an inland waterways service supplements rail, highway, air, and pipe line transportation, its operations are closely related to those others. Transfer points are always found at the origin and terminus of an inland waterway route, as well as at any intermediate terminals.

15. Military Sea Transportation Service

At terminals served by both an inland waterways service and the Military Sea Transportation Service close coordination between the two will be maintained through port authorities.

CHAPTER 3

PLANNING

Section I. ADVANCE PLANNING

16. General

In a theater of operations, movement requirements normally will exceed movement capabilities. During the advance planning phase of an operation the transportation net of the area under consideration must be fully investigated and each mode of transport integrated with others.

17. Intelligence

a. When considering the inland waterway system of an area the following information about the physical characteristics of the waterway must be obtained and evaluated.

- (1) Geographical location of the waterway.
- (2) Type of waterway (river, canal, bay, or combination thereof).
- (3) Restrictive features: depth of water, width of channel, size of locks, etc.
- (4) Effect of seasonal changes on waterway.
- (5) Location of locks, cuts, bridges, and other man-made features.
- (6) Navigational aids in use.
- (7) Speed of current.
- (8) Effect of winds and tides on waterway.

b. In addition to the aforementioned, all available information on the following should be collected and evaluated.

- (1) Location, capacity (fig. 1), etc., of terminals and transfer points and of transportation means serving these locations.
- (2) Type, location, and number of local craft suitable for use in area.
- (3) Indigenous personnel available to assist in operation of waterway.
- (4) Communications facilities used in operation of waterway.
- (5) Location and capacity of repair facilities.

18. Sources of Information

All available sources of information should be exhausted. Sources will include Army-Navy intelligence studies, strategic engineering studies, statistics published by commercial or governmental agencies, reconnaissance reports, harbor and coast pilot manuals, river pilot manuals, current and tide tables, hydrographic charts, photos, and personal experience.

19. Concurrent Planning

To insure the most rapid utilization of the waterway, advance plans should also provide for the employment of Engineer units to assist in the rehabilitation of locks and bridges and in the removal of obstacles.

COLLECT THESE DATA WHERE APPLICABLE	COMPUTE THESE FACTORS	DETERMINE
<ol style="list-style-type: none"> Channel depths Obstructions Capacity of rail facilities Capacity of highway facilities Capacity of pipeline facilities Capacity of air facilities Enemy air activity Enemy surface activity Climate Weather Contaminated areas Our own capabilities in combating obstacles 	<ol style="list-style-type: none"> Evaluate to determine: A. Inland terminal reception capacity 	
<ol style="list-style-type: none"> Tactical dispersion requirements Wharf and/or platform facilities Discharge rates Unloading rates Loading rates Extent of destruction or contamination Climate and seasons Weather and tide characteristics Materials handling equipment available Cargo handling equipment available Floating craft and equipment available Air field capabilities Transit sheds, yards, and areas Indigenous labor available Space reserved for local economy 	<ol style="list-style-type: none"> Evaluate to determine: B. Loading and/or unloading or transfer capacity 	Inland terminal through-put capacity
<ol style="list-style-type: none"> Capacity of rail facilities Capacity of highway facilities Capacity of inland waterway facilities Capacity of pipeline facilities Capacity of air facilities 	<ol style="list-style-type: none"> Add to determine: C. Clearance capacity 	

Figure 1. Checklist for estimation of inland terminal through-put capacity.

20. Planning Factors

In the absence of definite information to the contrary, factors may be used in advance planning when required (par. 23). If more accurate information on the particular section of waterway is available, it should be used.

21. Reconnaissance

a. As soon as possible after actual combat has ceased in the area served by the waterway system, reconnaissance should be initiated to determine the accuracy of all information gathered prior to the action (par. 18). In addition, the reconnaissance should determine the rehabilitation required as a result of combat damage to the area.

b. Because of their flight characteristics helicopters are a valuable means of carrying out detailed reconnaissance of an inland waterway.

Section II. COMPUTATION OF WATERWAY CAPACITY

22. Turn-Around Time

a. Turn-around time is the time required for a craft to be loaded at its home terminal, reach its destination, unload and reload, return to its home terminal, and be in position again ready to be loaded. It includes time for refitting and refueling, etc., unless carried on concurrently with loading.

b. Turn-around time in days = $\frac{\text{loading time} + \text{travel time} + \text{unloading time} + \text{locking time} + \text{refitting time}}{\text{hours of operation per day}}$

23. Components of Turn-Around Time

Turn-around time involves consideration of the following factors:

a. Length of Haul. Length of haul is the distance between loading and unloading points.

b. Speed. Average speed of the craft is influenced by several factors, all of which must be considered if a true figure is to be arrived at—

(1) *Speed of craft in still water.* They may be figured as an average of 4 miles per hour if other figures are not given.

(2) *Speed and direction of current.* Speed and direction of current can often be discounted since the resistance encountered when traveling in one direction may be balanced by assistance from the current when traveling in the other direction. However, this does not always apply. In rough streams the relative speed going downstream may have to be reduced because of the necessity to stop or maneuver at a moment's notice. Also, in areas where a tidal range exists, resistance from the current will be encountered at various stages of the tide. For these reasons, careful investigation should be made of existing conditions before assessing the effect of speed and direction of the current.

c. Loading and Unloading Time. Loading and unloading time is the time required to load and unload a craft at origin and destination. Where complete information for planning is not available, the

rate of loading and unloading is estimated as 8.4 short tons per barge gang per hour.

d. Time Consumed in Locks on Each Trip. In the absence of exact data, time taken by a craft and its tow to transit a lock may be figured as 1½ hours per lock, although some transits may be accomplished in as little as 20 minutes, depending on local conditions.

e. Hours of Operation Per Day. An operating day is normally estimated as 20 hours. The remaining 4 hours are used for the accomplishment of maintenance, refueling, restoring, rigging up, or dropping barges from the tow.

24. Capacity Formulas

On any inland waterway one of the two following possible conditions will determine the method of calculating the capacity of the waterway.

a. Sufficient Craft To Fill or Exceed Waterway Capacities. Sufficient craft or barges are seldom available to fill or exceed the capacity of an inland waterway. However, when this situation exists, the daily capacity may be estimated by determining the number of craft per day that can be passed through the most limiting constriction (a lock, lift bridge, narrow channel, etc.) and multiplying this figure by the average net capacity of the barges or craft in use.

b. Insufficient Craft To Fill or Exceed Waterway Capacity. When the capacity of a waterway is so large or the supply of craft is so limited that there are an insufficient number of craft to fill or exceed the capacity of waterway facilities, the following

methods may be used to make volume computations for sustained operations.

- (1) To determine the number of barges required to move a given number of tons a given distance each day, use the following formula:

Barges required=

$$\frac{\text{tons to be moved daily}}{\text{tons per barge}} \times \frac{\text{turn-around time in hours}}{\text{hours of operation daily}}$$

- (2) To determine the number of tons that a given number of barges can move a given distance each day, use the following formula:

Tons moved daily=

$$\text{number of barges} \times \text{tons per barge} \times \frac{\text{hours of operation per day}}{\text{turn-around time in hours}}$$

- (3) To determine the forward distance that a given number of barges can move a given number of tons each day, use the following formula:

Turn-around time=

$$\frac{\text{number of barges} \times \text{tons per barge} \times \text{hours of operation per day}}{\text{tons to be moved per day}}$$

25. Tug or Towboat Requirements

a. Having determined the number of barges required to perform a given task, the number of tugs or towboats required to efficiently operate those

barges may be calculated by using the following formula:

Number of tugs required=

$$\frac{\text{total number of barges in use}}{\text{number of barges per tow}} \times \frac{\text{turn-around time for tugs in days}}{\text{turn-around time for barges in days}}$$

b. To determine the number of barges a given number of tugs or towboats can efficiently operate over a given waterway, use the following formula:

Number of barges=

$$\text{number of tugs} \times \text{number of barges per tow} \times \frac{\text{barge turn-around time in days}}{\text{tug turn-around time in days}}$$

26. Increasing Capacities of Waterways

The volume of tonnage which can be transported by a given number of barges on a given inland waterway can be increased when the following factors are considered.

a. *Load Per Barge.* Inland waterway craft are normally designed to carry a specified load; however, under favorable operating conditions the load limit may be exceeded.

b. *Hours of Operation.* When information about scheduled operating hours is not available, an estimate of 20 hours per day is normally used. Any improvement in operations which will increase the length of the operating day will increase the capacity of the waterway. Use of navigational radar, for

example, may permit night operations even under blackout conditions.

c. Speed of Travel. Any increase in the speed of travel will reduce turn-around time and increase waterway capacity accordingly.

d. Time in Locks. Improvement in lock operations which reduces transit time for craft will also reduce turn-around time and increase waterway capacity.

e. Channel Improvements. Under conditions of craft saturation on a waterway, alteration of the limiting constriction of the waterway will increase waterway capacity.

f. Size and Type of Tows. An increase in the number of barges towed by each tug or towboat will increase the over-all capacity of the waterway. However, the additional towboat load must not reduce the number of tows transported per day to the extent that the quantity of cargo hauled is equal to or less than that hauled in tows of normal size. In terms of tons of cargo moved per horsepower, push-towing ranks first, pull-towing second, and towing with barges abreast of the towboat last. However, the size of the waterway frequently restricts the methods by which the barges and other marine equipment are towed.

g. Loading and Unloading Time. Any improvements in materials handling, loading methods, or terminal operating procedures which serve to reduce time required for loading and unloading barges greatly increases waterway capacities by reducing barge turn-around time.

h. Precautions. The means and methods of increasing waterway capacity (*a* through *g* above) should be used only after careful analysis of equipment being used and conditions under which such equipment is being operated. For example, loading tugs beyond their normal and safe capacity or operating them at excessive speeds could result in excessive requirements for waterway and shore maintenance facilities. Thus, any advantage gained in increasing waterway capacity would be offset.

CHAPTER 4

ORGANIZATION OF MILITARY AND INDIGENOUS PERSONNEL

27. General Considerations

In planning the type and size of organizations which will operate an inland waterway the following factors must be known before a definite organization can be established:

a. The extent to which military personnel and equipment are to be used.

b. The type of waterway involved (par. 17*a*). A river whose currents, depth of water, and channels vary due to seasonal changes may require different craft than a canal whose currents, depth, and channels are more or less constant.

c. The necessity for training military river pilots. If the system is large, it may be necessary to train pilots to operate over a particular section. It is inadvisable to train such personnel over a distance greater than 150-200 miles. (For details on piloting see TM 55-370).

d. The requirements for administrative personnel, cargo handlers, warehousemen, and security guards at terminals and like installations.

28. Basic Organization

When required, the inland waterways service is organized to control and operate Transportation Corps

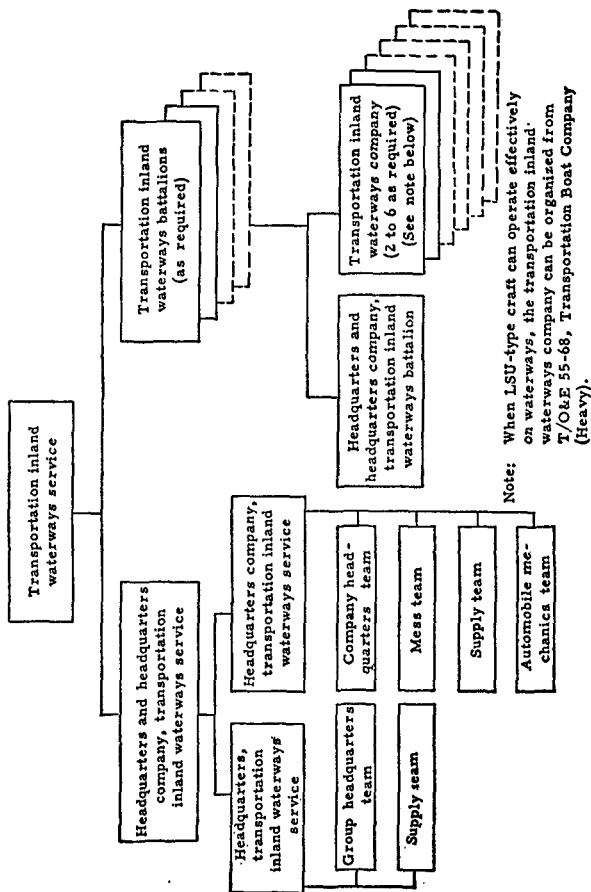


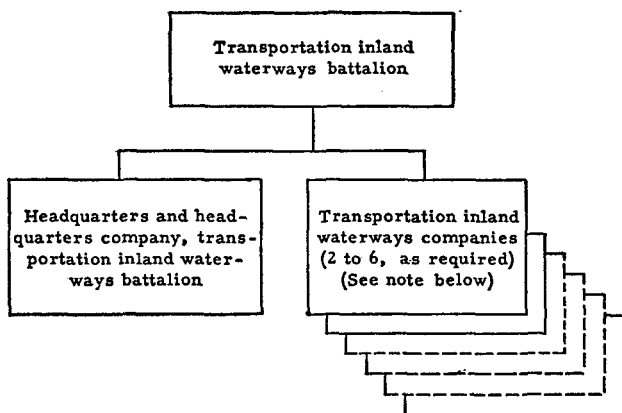
Figure 2. Typical transportation inland waterways service.

craft and small indigenous craft capable of being used for military purposes on inland waterways. Personnel are selected from T/O & 55-500. This T/O&E provides basic teams in a number of different categories and sizes, thus affording sufficient flexibility to provide a suitable organization for an operation of any type or scope (fig. 2). The inland waterways service may be composed entirely of military personnel; however, operation by indigenous personnel supervised by the military conserves military manpower and should be instituted as soon as practicable.

29. Inland Waterway Operating Units

a. The size of an inland waterway operating unit will depend upon a number of factors, including the mission of the unit, the number and type of craft to be operated (which depends upon the quantity and type of cargo to be moved), characteristics of that section of waterway over which the unit is to operate, length of the lines of communication, and the means available to the unit for supervision of its subordinate elements. Normally, the senior operating organization will be a battalion (fig. 3) composed of a headquarters and headquarters company (fig. 4) and two to six operating companies. When the total number of required personnel varies between 100 and 300, a company will serve in place of a battalion as the senior operating unit; a platoon will suffice when the total number of personnel required for the operation is found to be less than 100. For planning purposes, it is reasonable to assume that battalion-size units

can be used to advantage over a waterway approximately 300 miles long. The companies of the battalion could be given a 100 mile area on which to operate and train their pilots.



Note: When LSU-type vessels can be effectively operated on a waterway, a transportation inland waterways company can be organized from T/O&E 55-68, Transportation Boat Company (Heavy).

Figure 3. Typical transportation inland waterways battalion.

b. The size and composition of the transportation inland waterways unit will vary according to the number and type of craft assigned, the hours per day these craft are to be operated, and the length of the line of communications. A typical transportation inland waterways unit may be organized as shown in

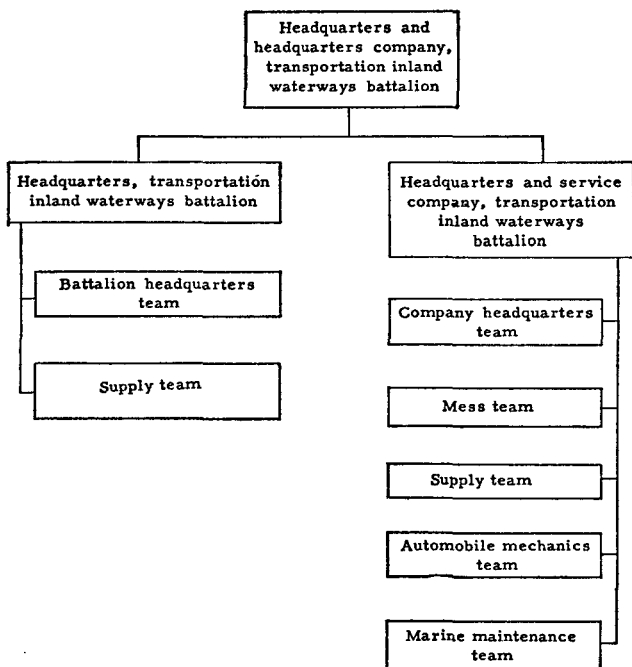


Figure 4. Typical headquarters and headquarters company, transportation inland waterways battalion.

figure 5, using appropriate cells from T/O & E 55-500. When landing craft (utility) (LCU) can be operated, the transportation inland waterways unit will be organized under T/O & E 55-68 (fig. 6).

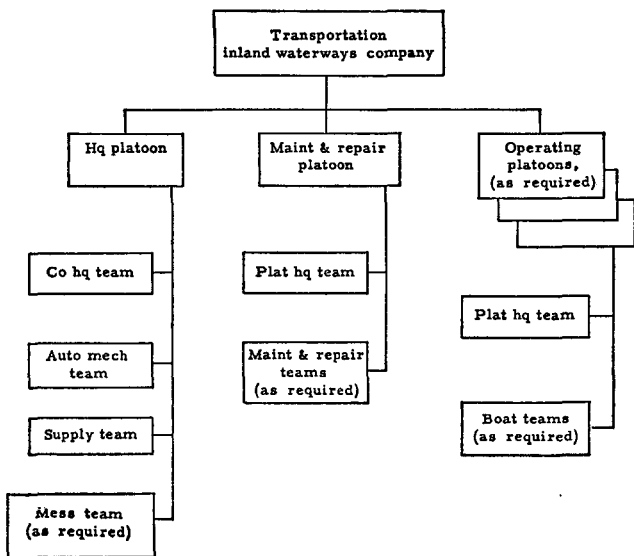


Figure 5. Typical transportation inland waterways unit (based on T/O & E 55-500).

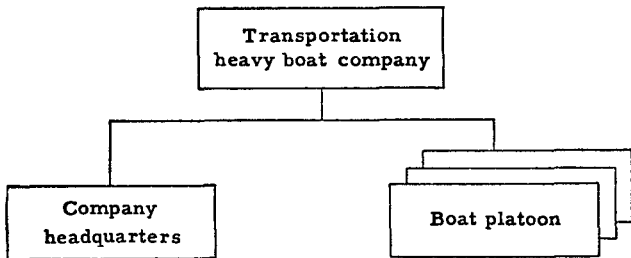


Figure 6. Transportation heavy boat company, T/O & E 55-68.

30. Forming an Inland Waterway Organization

An inland waterway unit can be formed from T/O & E 55-68 and teams provided in T/O & E 55-500 as follows:

a. When the military requirements for inland waterway transportation are known, determine the number of cargo craft required to accomplish the mission. This fleet of vessels should then be organized into companies or battalions, depending upon the size of the operation.

b. Based on the number of cargo craft to be used, determine the number of patrol and utility craft required for control and other administrative purposes.

c. Refer to T/O & E 55-500 for appropriate boat teams to man all craft determined in *a* and *b* above. If round-the-clock operation is contemplated, additional personnel to meet this requirement must be requisitioned.

d. Divide the personnel determined in *c* above into suitable operating platoons of between 40 and 100 men each, and add a platoon headquarters team for each operating platoon.

e. Based upon the total number of craft, determine the number and type of boat maintenance and repair teams required; form these teams into a boat maintenance and repair platoon by adding a platoon headquarters. If the total personnel for boat maintenance and repair does not exceed 40, those personnel may be organized as a section of the company headquarters platoon.

f. Add suitable company headquarters team, auto mechanics teams, supply teams, and traffic regulating teams as required.

g. Total all personnel (*a* through *f* above), subtract the number of personnel for which mess personnel are provided within boat crews, and select a suitable mess team to provide for the remainder who are shore based.

h. The total of all personnel mentioned in *a* through *g* above will be the total strength of the unit and will form a platoon, company, or battalion organization.

i. Where LCU's are utilized on inland waterways, reference may be made to T/O & E 55-68 for organization of a company.

31. Employment of Indigenous Labor

a. The employment of indigenous labor is a command responsibility requiring complete and coordinated staff support and normally accomplished through the civil affairs-military government units during combat and post-hostility operations.

b. The control, operation, and administration of waterway transportation during peacetime is usually handled by organizations or commissions set up by either private or governmental agencies. These organizations, when sympathetic to United States forces and supervised by military personnel, provide a central agency through which civilian labor can be controlled to aid in the accomplishment of military

transportation requirements. In addition, this use aids in sustaining the civilian economy.

c. Civilian personnel handbooks prepared by the Office of the Secretary of Defense describe the forms, records, and reports required for controlling and administering indigenous personnel. In addition, each manual gives background and operational information on the specific country or area concerned in the handbook. These handbooks are issued only to units having a requirement for them.

CHAPTER 5

OPERATIONS

Section I. OPERATING DIVISIONS

32. Functions of Operating Units

The functions of an operating unit of an inland waterways service (fig. 7) are best described by summarizing the primary duties of the chief or director of operations, who is the operating manager of all floating and terminal equipment for which his organization is responsible. He is responsible for—

a. Accomplishing programmed movements set up by authorized movement control agencies. This task involves coordinating craft and terminal operations to assure the steady flow of traffic from points of origin to points of delivery.

b. Maintaining all floating equipment. Transportation Corps harbor craft maintenance units may be attached to accomplish other than organizational repairs.

c. Dispatching all floating equipment.

d. Locating dispatched equipment at all times.

e. Advising pilots or operators of self-propelled units of the condition of the waterways; supplying inland waterway craft with navigational charts procured from the theater engineer in oversea theaters and from U.S. Coast and Geodetic Survey in the United States and its possessions.

f. Supervising, when directed by higher authority, the inland waterway operations performed by indigenous personnel and native equipment authorized by the civil affairs-military government section.

g. Checking on facilities for refueling and resupplying fresh water so that vessels may operate efficiently. These facilities are most important to those vessels assigned to operate intersectionally.

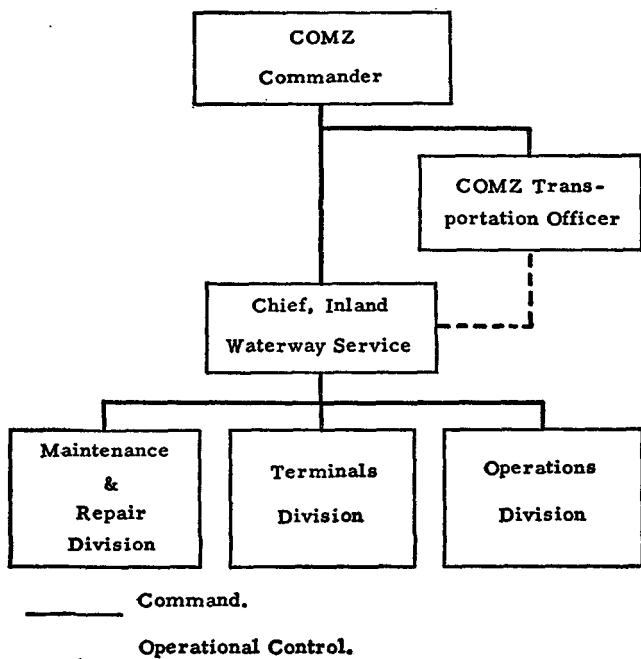


Figure 7. Functional organization of a typical transportation inland waterways service.

33. Terminal Operations

a. Inland waterway terminals handle the following types of cargo:

- (1) In-transit loads of temporarily stored while awaiting disposition instructions.
- (2) Loads being transferred from inland waterways to another mode of transportation.
- (3) Cargo broken down from bulk shipments and reshipped in small units, or collected from other points to make a transportation unit for reshipment.

b. Each terminal should be adequately staffed and equipped to handle all scheduled movements. The staff of a small terminal usually will include an officer as terminal representative of higher headquarters and an assistant to supervise loading and discharging operations.

c. A terminal report of barge movements and tonnages handled and anticipated is issued daily. The terminal should have a reports section that is responsible for keeping the records and statistics required both by higher headquarters and for operational control purposes.

d. When the terminals operated by military units are located at considerable distances from each other, appropriate mess teams should be assigned each terminal.

e. At inland waterway terminals where indigenous labor is utilized, military supervision of native personnel is required. During peak loads cycles of indigenous labor can be supplemented by military units.

f. At terminal installations where large tonnages are handled, maximum use should be made of materials handling equipment.

Section II. COMMUNICATIONS AND DISPATCHING

34. Communications Afloat

a. The installation and maintenance of visual and electronic communications facilities aboard floating military equipment is vital to the efficient operation of a waterways service. Visual signals include semaphore and flag hoists used during daylight, and blinker lights or pyrotechnic devices used at night. Electronic types of communications include radio and radiotelegraph.

b. United States Naval Hydrographic Office Publications, volumes 87 and 88, set forth procedures for signaling with the international alphabet flags and numeral and answering pennants, for blinker and sound signaling by international Morse code, and for flag signaling with semaphores.

c. All communications originating from floating equipment will comply with existing signal operating instructions (SOI). A copy of these instructions should be aboard all vessels equipped with Signal Corps equipment. Further information on communications may be found in ACP 124 (A), and TM 11-454.

35. Communications Network Ashore

Communications facilities at shore installations are integrated into the area communications network.

At dispatching points, headquarters, and at terminals, ship-to-shore radio facilities should be available. These communicating facilities are essential in expediting the dispatch and operation of all marine equipment. On waterways having locks, narrow gorges, or other constricting features, congestion can be minimized by the use of ship-to-shore radio or visual communicating facilities. A direct communications connection between operating units and the movement control agency, located usually in higher headquarters, should be established as soon as possible. With direct communications, movement programming can be transmitted rapidly to the operating agencies.

36. Importance of Dispatching

a. The successful movement of supplies and equipment and the planning of future movements depend largely upon expert dispatching. The chief dispatcher is usually located in the headquarters of the operating unit and has operational control over the equipment which is located in the area. He is responsible for the following:

- (1) Authorizing the movements of vessels.
(Except at the discretion of the master of a vessel, no vessel may be moved unless the chief dispatcher or his representative has so directed.)
- (2) Knowing the exact location of barges, towboats, and other equipment on the waterway at all times.

- (3) Knowing the operational status of equipment in use. (Information concerning the date of readiness or expected availability of all floating equipment in marine repair depots, the completion date of vessels in the process of being loaded or unloaded, and the expected arrival date of additional equipment being allocated to a specific section of the waterway should be passed to the chief dispatcher.)
- (4) Being thoroughly familiar with local signal operating instructions and seeing that vessels comply with these rules.

b. An operation board showing graphically the location of all floating equipment will greatly assist the dispatcher.

37. Methods of Dispatching

a. Because of the changing physical characteristics of waterways, dispatchers, like pilots, cannot operate efficiently over routes that are too long. The length of the section assigned to a dispatcher should be gaged by the quality of communications and terminal facilities that exist over the route. Terminals with communications facilities should report passing towboats or barges to dispatchers along the route whenever these are seen. Communications between masters of vessels and dispatchers should contain the most recent information concerning aids or hazards to navigation. A vessel should be advised when traffic has halted or become congested. This exchange of navigational data is one of the best methods of

keeping a master of floating equipment informed of the condition of waterways through which he is proceeding or will proceed.

b. In order that the transfer of supplies and personnel is expeditiously accomplished, dispatchers at waterway terminals which serve as transfer points should maintain close liaison with the dispatching units of highway and air terminals.

Section III. PILOTING

38. The Pilot

a. The term marine pilot refers to any person having technical knowledge of local waterways such as sounds, bays, harbors, canals, and rivers. On inland waterways the designation pilot frequently refers to the individual qualified to maneuver the vessel on various sections of the waterway with which he is acquainted. The position of pilot should be filled only by skilled and highly trained personnel. A tremendous operational advantage can be gained if the services of indigenous pilots can be obtained.

b. In areas where the attitude of the civilian population is unfriendly, initial piloting of vessels through difficult waters will of necessity have to be conducted by military pilots. They must use whatever intelligence is available and obtain information from patrols stationed along the route and from helicopter reconnaissance.

39. Maneuverability of Tows

The maneuverability of inland waterway tows depends upon the position of the propelling vessel.

All marine units may be divided into the following position categories:

a. Craft Operated Singularly. Singularly operated craft have the advantage of being faster and more easily maneuvered.

b. Craft Pulled. The pull method of towing is frequently preferred in extremely narrow rivers and canals whose navigable channels are winding. For a description of rigging used in pull-towing see TM 55-370.

c. Craft Pushed.

- (1) Where the physical characteristics of an inland waterway will permit, push-towing is the most efficient means of maneuvering a tow. In push tows, barges are assembled lengthwise, end to end, as many as two or three abreast.
- (2) One of the latest developments of the push tow is the integrated tow. This tow is formed of specially designed barges having bow sections suitably raked and an intermediate section with fully squared ends. The towboat has a square bow. The flotilla is fleeted in the same way as the normal push tow. The advantage of the integrated tow is that the turbulence created between the after end of a leading barge and the forward end of a following barge is reduced, and the general lines of flow around the towboat and its barges are improved, allowing an increase in propulsion efficiency.

- (3) When taking loaded tows of the push tow type downstream in a swift current, the towing ability of the pushing towboat is limited by its backing ability. In order to stop the tow at a predetermined point along the bank, a boat must possess sufficient backing power to bring the fleet's astern speed up to or in excess of the current speed.
- (4) One hazard encountered in push-towing is the tendency of the leading barge to "dive" when loaded to a deep draft. The pilot must promptly reduce the speed of his tow at the first sign of water rolling over the forward edge of the lead barge.

d. Craft Towed From Bank. On some inland waterways, facilities exist for towing vessels on towlines pulled along the banks. A towing hook attaches the towlines to a tractor running on rails or pneumatic tires. Usually only one barge can be towed by this method. Tow ropes are generally steel-cored Manila rope, 2 inches in diameter, and approximately 100 to 125 feet in length.

40. Piloting on Sheltered Waterways

Piloting on inland waterways requires certain operating techniques generally different from those used in harbor and landing craft operations. Effective piloting on inland waterways demands familiarity with the additional aspects of navigation outlined below.

a. Piloting Rules. On almost all inland waterways throughout the world there exist local piloting

rules, passing signals, and rules of the road. These signals can be used by military personnel on those inland waterway systems where military vessels operate.

b. Floating and Submerged Mines. During the early stages of a military operation, and even during post-hostility phases, marine operations will be greatly restrained by the presence of floating and submerged mines. Elimination of these navigational hazards must have priority. On waters adjacent to coastal harbors and seaports naval mine sweepers may assist in removing this hazard.

c. Load Limits. When channel depths are restricted, the master of a tow should promptly advise the director of operations or the loading officer at a terminal of the maximum draft to which the tow may be loaded for the scheduled voyage.

d. Double-Tripping. To navigate a push tow upstream through a section of a waterway where the speed of the current is greater than the speed of the tow, pilots double-trip the tow. Part of the tow is tied off or moored securely below the critical reach of the river; the pilot then proceeds with the remainder of the tow to a point above the critical reach and safely ties the barges off to the bank. The towboat then returns downstream, picks up the barges originally tied off, and tows these to the barges upstream. The barges are then tied on and the tow continues upstream.

e. Other Special Piloting Techniques. Piloting of push and pull tows on sheltered waters requires special techniques to avoid tow "skid" when round-

ing bends and to keep from overshooting the destination point when running downstream in swift currents. Pilots should also be familiar with the technique of piloting through eddies; how to maintain steerage control during upstream piloting; and the minimum clearances of the vessels and the channel depths over which they are expected to operate.

41. Rudders

It is the maneuverability of a boat that permits safe and fast steering. Maneuverability is the result of good rudders as well as propelling machinery. On inland waterway push towboats, as many as six rudders are installed (fig. 8). The rudders forward of the propellers are referred to as flanking rudders, those aft of the propellers as steering rudders. The greater maneuverability of the push towboat and its tow results from this type of rudder installation.

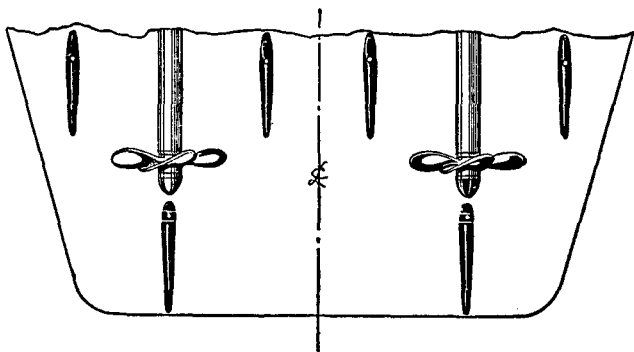


Figure 8. Location of rudders on an inland waterway push towboat.

42. Navigational Aids

Aids to the navigator or pilot of inland waterway craft are of two types—devices or equipment installed aboard the vessel and bulletins and charts obtained from various sources and commands.

a. Navigational Radar. The majority of all the larger Transportation Corps self-propelled vessels are now equipped with navigational radar. In areas where poor visibility occurs frequently, vessels equipped with radar have increased their operating hours as much as 10 percent. Although conventional types of navigational radar do not clearly define vertical obstructions such as bridge piers, the experienced pilot can safely maneuver his tow at reduced speeds while running exclusively on radar.

b. Echo Sounding Devices (Fathometer). Sounding devices with low recording tolerances are of considerable aid in inland waterway navigation. Portable types can be temporarily installed aboard native craft to assist military personnel in maneuvering craft in uncharted channels and strange waterways.

c. Lead Line and Sounding Pole. The two most common means of manually sounding are the lead line and the sounding pole. Because of the shallow waters encountered, markings of an inland waterway lead line differ from those found on the deep-water type, being marked off in measurements of 1 foot instead of 1 fathom. The sounding pole is usually 12 to 15 feet long and marked off in measurements of 1 foot.

d. Navigational Lights. All military vessels are equipped with navigational lights in accordance with

United States Coast Guard regulations. In addition, all military tugs are equipped with searchlights which are of considerable help in locating navigational buoys or landmarks at night. Theater regulations governing the use of illumination during darkness should be disseminated to all vessels and strictly adhered to at all times.

e. Radio. All military inland waterway craft should be equipped with radio equipment. Uninterrupted communications between vessels and shore points are of utmost importance in obtaining maximum performance from vessels and allowing waterways to accommodate a maximum load capacity. When signal operating instructions permit, frequent contact between vessels passing in opposite directions should be made so that information on channel and traffic conditions in the sections through which either vessel has passed may be exchanged.

f. Portable Communications. A portable communicating system between the pilot house and head or tail of the tow is essential to tows which are several hundred feet long, or when a tow of any length anticipates bad weather.

g. Compasses. All military craft are equipped with either standard magnetic compasses or gyrocompasses.

h. Radar Navigation Charts. Navigation charts of inland waterways are distributed by the theater engineer in oversea theaters and by the U. S. Coast and Geodetic Survey in the United States and its possessions. These charts usually indicate aids to navigation and the navigable channels of a waterway,

called the sailing line. Radar navigation charts have been prepared for many inland waterways to assist boat operators under conditions of limited visibility. Such charts, when used in connection with the radarscope, will assist pilots in ascertaining their location by known landmarks.

i. Dissemination of Navigational Data. On inland waterways having irregular channels, critical currents, and other hazardous conditions, a system for disseminating data on these changing conditions should be established in the headquarters of the unit operating the waterway. This data can be compiled from daily trip reports or radio reports from vessels engaged in operations over critical sections of the waterways.

43. Lookouts

a. Whenever the maneuvering or navigation of an inland waterway vessel and its tow becomes restricted due to bad weather or other barriers along the waterway, a lookout should be posted to report approaching objects and landmarks to the pilot house. The length of a watch will vary with existing conditions and circumstances, but normally should not exceed 2 hours.

b. Lookouts report all objects sighted in relation to the fore and aft line of the vessel using the 32 points of the compass.

Section IV. SPECIAL OPERATIONS

44. Floating Grounded Vessels

Cooperation and assistance should be extended by all military personnel to any vessel in distress. The salvage of marine equipment on a waterway is primarily governed or controlled by the geophysical characteristics of such a waterway, particularly where hydrographic features vary widely. On inland rivers the salvage of equipment is usually more difficult than on canals where the waterways are more protected. See TM 55-370 for methods of floating grounded vessels.

45. Icebreaking

a. Types of Ice Formations. Ice formations that obstruct navigation on rivers and canals of inland waterways are mainly of two types.

- (1) Flat-type ice forming a bank-to-bank obstruction.
- (2) Ice gorges formed by the flow of floating ice which becomes jammed across a navigable channel having swift currents.

b. Icebreaking Methods. Ice formations on navigable waterways may be broken by using a self-propelled vessel built especially for that purpose or by rigging icebreaking devices on self-propelled vessels, or by the use of explosives.

c. Maneuverability of Tows. When a path is broken through an ice field, the width of the passage is frequently very narrow and maneuvering room is

restricted. In the case of the push tow, it may be advantageous to place a few of the barges astern of the towboat to permit greater maneuverability.

d. Vessels in Ice. Extreme caution should be taken in ice fields when using wooden craft, for these are easily damaged. Vessels propelled by stern or paddle wheels are very inefficient when operating in ice.

46. Operation in Arctic Areas

a. Special vessels and equipment are required for inland waterway operations in arctic areas. Specially designed ice-breakers must be employed to force passages through the loose floes and drifting icepacks to clear a path for the movement of inland waterway craft. For navigating smaller streams, loads must be lighter and vessels of extreme shallow draft must be employed.

b. The conditions under which vessels and equipment must operate in the arctic result in more than normal wear. Not even an icebreaker can stay in the ice for prolonged periods without showing signs of stress. Damaged propellers or rudders and smashed and torn hull platings are the most common types of damage. Advanced plans must provide for necessary maintenance personnel and equipment to make repairs, since supply expeditions cannot rely on the serviceability of equipment left at installations the previous season.

Section V. RIGGING OF TOWS

47. Length of Towing Hawser

a. The length of the hawser used in pull-towing will vary, but sufficient length should be allowed to avoid the backwash of the towing vessel.

b. In order to prevent towing lines from becoming fouled in the propellers of the towing vessel, care must be exercised when releasing the hawser.

48. Wires, Cables, Chains, and Ratchets

In inland waterway operations, towed vessels are rigged to the towing vessel by various methods. The most important and most frequently used rigging aboard inland waterway tows are Manila lines, chains, wire cables, and ratchets.

49. Typical Layout of Rigging in Push-Towing

Pelican hooks, rigging connectors that can be quickly disconnected, should always be used on those lines that secure the pushing vessel to the tow. The barges are secured together with hawsers, wires, chains, and ratchets at the athwartship connections. The towboat is usually secured to the after barges by wire ropes leading from power- or hand-driven windlasses on the bow of the tugboat. These wire ropes are placed over the outboard stern bitts of the outer after barges, and additional steel or Manila hawsers are placed between the towboat and the inboard after center bitts of the barges ahead of the towboat. The towboat can be freed from the barges in an emergency

such as collision, sinking, or rescue of a man overboard.

50. Typical Layout of Rigging on Pull Tows

a. On some wide waterways barges are towed astern on individual wire hawsers from powered windlasses aboard the towing craft. These wire hawsers are run through spring-loaded clamps mounted on the after deck immediately abaft the towing windlasses. By this system it is possible to vary the length of individual tow ropes while under way and to haul barges in before stopping the towing vessel. Wire hawsers passed out from the tug are taken aboard each barge and placed in a hook which is fastened to one of the outboard bow bitts. This method of rigging relieves intermediate barges of towing stresses in two directions.

b. When Manila lines are used in pull-towing, a fire-ax should be handily placed to sever lines in an emergency.

51. The Capstan

With few exceptions, inland waterway craft is equipped with power-driven capstans or windlasses to assist in making up tows, to maneuver the vessel by running a hawser to the bank, or to handle heavy objects such as the anchor. Many nonpropelled barges have hand-powered capstans on the bow and/or stern. These capstans are useful in moving the barges for short distances along the bank or wharfs when there is no tug available.

52. Moorings

a. On inland waterways the term mooring refers to securing the craft, or its tow, or both alongside a dock or bank, or anchoring in the stream. When mooring a craft or its tow, allowances should be made for tidal conditions and meteorological variables. A number of lines sufficient to assure maximum security should be used to moor or tie off the craft.

b. Mooring inland waterway craft may be prohibited in restricted channel areas, particularly when the craft's cargo is flammable or offers similar hazard. Restricted areas are explicitly defined by theater commanders and should be avoided.

c. When mooring with anchors, bearings on nearby objects should be frequently taken to determine if the anchor is dragging. In narrow anchorages if caution is not exercised, a craft swinging on its moorings may obstruct the waterway, collide with passing craft, or ground itself.

53. Fenders

Fenders should be rigged to protect hull areas in contact with the sides of barges, lock walls, or quays.

CHAPTER 6

TERMINALS

Section I. GENERAL

54. Types of Cargo

Waterway systems readily lend themselves to logistical support of military operations in large movements of class I, III, and V supplies (rations, POL, and ammunition), and class IV construction materials and equipment.

55. Types of Terminals

All terminals along inland waterway systems can be classified as either general cargo, liquid, or dry bulk commodity terminals. A few terminals are equipped for the following special operations:

a. Moving semitrailers onto the decks of various types of inland waterway barges.

b. Moving railroad cars onto barges or car floats especially designed for this type of railroad equipment.

c. Lifting and dumping the entire contents of railroad cars into the holds of inland waterway vessels by means of car tipping devices.

Section II. GENERAL CARGO TERMINALS

56. Coastal Port Terminals

a. Ports frequently will be served by both an inland waterways service and ocean shipping. In such cases greater cargo handling efficiency is gained by having inland waterway vessels come alongside berthed ships to receive cargo directly from the holds. Such cargo handling can be accomplished simultaneously with discharging of cargo from the same hold to the pier, wharf, or quay.

b. When the clearances of a waterway are sufficient, the direct method of handling cargo described above is an economical and efficient means of unloading military vehicles to be transported from ocean ports to inland points and storage areas served by the waterway system.

c. Congestion and delay, inherent in the present method of handling package cargo at large ports of embarkation served by inland waterways, can be greatly reduced by the use of cargo containers or pallets. These units can be handled directly from the holds of the oceangoing vessels to the inland waterway barges. The possibilities of this method of handling general cargo are unlimited and should be fully exploited.

57. Inland Port Terminals

a. Inland ports along foreign waterways frequently handle greater cargo tonnages than do sea-ports. At foreign inland ports there exists well organized civilian clearing, forwarding, and steve-

doring agencies. When the attitude of indigenous personnel in such organizations is friendly, maximum use should be made of these agencies in administering and conducting terminal operations.

b. The load and discharge demand of most river ports will be amply served through the use of floating wharf boats connected to shore by a hinged bridge. Such an arrangement will stand nominal changes in river levels. In the event of a major change in water level, necessary adjustments can be made.

58. Requirements Typical of an Inland Waterway Terminal

During the combat phase of a military operation port facilities may be rendered inoperable and may remain so until the Corps of Engineers is able to rehabilitate the port facilities and terminal installations. Such installations should provide transfer points to other modes of transportation. In addition, facilities for refueling, watering, and provisioning waterway craft should be available.

Section III. BULK LIQUID TERMINALS

59. Bulk Liquid Storage

Liquid commodities may be stored along inland waterways at bulk petroleum products storage terminals operated by the Quartermaster Corps. The Corps of Engineers designs, constructs, operates, and maintains facilities to pump petroleum products forward to dispensing tanks or pipeline terminals; the

Quartermaster Corps receives the products at these points and dispenses them in bulk or in containers and operates drumming plants and dispensary facilities.

a. Permanent tanks ranging in individual capacities from 500 to 268,000 barrels can be installed at surface or subsurface levels. Installation of these tanks is a function of the Corps of Engineers.

b. Temporary storage of bulk liquid products is facilitated by the use of portable storage tanks of various capacities. The construction and installation of steel tanks and the installation of collapsible containers of over 10,000-gallon capacity are also under the jurisdiction of the Corps of Engineers. For further information on storage facilities for bulk petroleum products, see AR 890-15 and TM 5-350.

60. Loading or Discharging Facilities

At bulk liquid storage terminals two berths should be provided whenever possible—one for loading liquid products and the other for discharging such products. By this arrangement, possible contamination of different cargoes is kept at a minimum. All inland terminals should have pumping facilities for loading and/or discharging. Safety should be foremost in the minds of all personnel required to handle inflammable cargoes.

61. Contamination

Personnel at terminals handling bulk liquids should exercise extreme precautions to prevent con-

tamination. Contamination should be guarded against especially when highly volatile chemicals such as those used to propel guided missiles are handled. Close liaison between Transportation Corps personnel and Quartermaster Corps personnel should be maintained, since the Quartermaster Corps is responsible for the quality surveillance of petroleum products.

Section IV. TERMINALS HANDLING BULK SOLIDS

62. General

Certain terminals are equipped to handle bulk solid materials such as coal, grain, gravel, sand, cement, and other pulverized commodities.

63. Coal Loading and Discharging

Coal is usually loaded into barges through chutes from storage bins and is unloaded with mechanical equipment such as clamshell buckets or conveyors. When loading coal by chutes, terminal personnel should take necessary precautions to see that the barges are evenly trimmed after loading and loaded to the proper drafts stipulated by the master of the towboat which is to move the barge.

64. Pulverized Commodity Terminals

Pulverized commodities include bulk grain, minerals, sand, cement, and various type of ores. Suction-type grain elevators, most commonly used, have an unloading capacity of approximately 150 to 200 tons per hour.

Section V. MECHANICAL HANDLING EQUIPMENT

65. General

a. Since many foreign inland ports are well equipped with mechanical handling equipment or can readily be adapted to such equipment, inland waterway vessels generally are not so equipped.

b. Terminals handling bulk solid cargoes generally are equipped with clamshell buckets, and only in terminals where general cargo is handled are slings, pallets, or trays used.

c. Fork lift trucks and mobile Diesel and gasoline cranes are widely used for warehouse storage work.

d. Trucks and pipelines are employed in handling liquid fuels and chemicals. When handling heavy liquids in cold temperatures, arrangements must be made for heating the tanks of the vessel and the pipeline so that the liquids remain in a fluid state.

66. Rough Terrain Equipment

When it is necessary to construct or provide cargo handling facilities for an inland waterway terminal on river banks whose terrain is rough, consideration should be given to the use of recently designed military equipment for the mechanical handling of cargo over bad terrain. Use of this equipment permits establishment of less elaborate terminal facilities since such equipment can transfer cargo from inland waterway vessels across river and canal banks to vehicles, railroad cars, or other vessels.

CHAPTER 7

MAINTENANCE, REPORTS AND RECORDS, AND SAFETY

Section I. MAINTENANCE

67. Echelons of Maintenance

a. Maintenance of equipment is divided into three broad categories and five echelons in accordance with AR 750-5.

b. The basic types of maintenance are—

- (1) *Organizational maintenance.* An organization using its equipment has the responsibility of organizational maintenance. This maintenance consists of checking proper operation, preventing disorders, inspecting, cleaning, servicing, preserving, lubricating, and adjusting as required. Organizational maintenance is further broken down into two echelons. First echelon maintenance is that which is performed by and is the responsibility of the equipment operator; second echelon maintenance is performed by trained mechanical personnel of the using organization.
- (2) *Field maintenance.* Field maintenance is that authorized and performed by desig-

nated maintenance activities in direct support of one or more using organizations. The field maintenance category incorporates the third and fourth echelons. Third echelon maintenance is performed by floating machine shops or other mobile marine facilities, or by a maintenance section in the inland waterways operating unit capable of replacing parts and repairing the overflow from lower echelons. Fourth echelon is maintenance performed in permanent or semipermanent installations in support of using units, and the repairs made to major items of equipment or vessels for return to the using organization as authorized.

68. Channel Maintenance

Channel maintenance functions for which the inland waterway service is responsible normally consists of the refueling and repainting of channel markers and other navigational aids. Installation of these items, including driving of piles, and similar heavy construction activities, normally are functions of the Corps of Engineers.

69. Personnel

a. Cells containing personnel for maintenance of Transportation Corps marine equipment are requisitioned on the allowances described in T/O & E 55-500 (par. 31e).

b. Due consideration must be given to the area on which the inland waterway equipment is being operated. Areas with ice conditions may require additional personnel for hull repair and propeller and rudder repair due to the higher damage rate to these parts in ice-laden waters.

Section II. REPORTS AND RECORDS

70. Required Reports and Records

SR 55-510-1 provides for the maintenance of records used in the operation of harbor craft including inland waterway craft. In addition, theater commanders will frequently require and authorize preparation of records other than those listed in SR 55-510-1.

71. Miscellaneous Reports and Records

Other reports and records relating to inland waterway vessels and marine operations are DA AGO Form 55-26 (Harbor Boat Data Sheet); DA AGO Form 55-33 (Operating Cost and Utilization of Harbor Boats); a manifest of all supplies transported by harbor craft; and an inventory of medical properties aboard vessels.

Section III. SAFETY

72. Station Bills

On self-propelled inland waterway craft which require several crew members, a station bill will be prepared and posted showing the position and duty

of each crew member at emergency drills. The station bill will be kept current when crew members are assigned or transferred.

73. Safe Handling of Inflammable and Combustible Cargoes in Vessels

a. With proper equipment and supervision, hazardous cargoes, in bulk or package, especially petroleum products and ammunition, can be safely handled aboard inland waterway vessels.

b. For information concerning the safe handling of inflammable cargoes consult Regulations Governing Transportation of Military Explosives on Board Vessels During Present Emergency (U. S. Coast Guard).

74. Safety of Crews

a. Safety is a command function. The command of each Army installation is responsible for maintaining an adequate accident prevention program on an installation-wide basis. Because most of the cargo handled is of a bulky or heavy type, care must be exercised in handling and stowing to prevent accidents.

b. Safety programs to protect inland waterway crews from chemical, biological, and radiological hazards will be established by the chemical staff officer in the area in which the inland waterways are located. These programs should be an important part of the standing operating instructions.

c. For further information regarding safety program, see AR 385-10.

APPENDIX

REFERENCES

1. Field Manuals

- FM 21-5 Military Training.
- FM 21-8 Military Training Aids.
- FM 21-30 Military Symbols.
- FM 55-10 Movement Control in Theaters of Operation.

2. Technical Manuals

- TM 5-350 Military Pipe Line Systems.
- TM 10-466 Handling of Petroleum Products.
- TM 11-454 The Radio Operator.
- TM 55-370 Operation of Small Boats and Harbor Craft.

3. Army Regulations

- AR 385-10 Army Safety Program.
- AR 750-5 Maintenance Responsibilities and Shop Operation.
- AR 890-15 Petroleum Supply System.

4. Special Regulations

- SR 55- Harbor Craft.
510-1

- SR 110-1- Index of Army Motion Pictures,
1 Kinescope Recordings, and Film
Strips.
- SR 310- Military Publications.
20-series
- SR 320-5- Dictionary of United States Army
1 Terms.
- SR 320- Authorized Abbreviations.
50-1

5. Tables of Organization and Equipment

- T/O & E Transportation Heavy Boat Com-
55-68 pany.
- T/O & E Transportation Corps Service Or-
55-500 ganization.

6. Miscellaneous

- Allied Communications Publication 124 (A),
Communications Instructions Radio Tele-
graph (W/T) Procedure (ACP 124A).
- United States Naval Hydrographic Office Pub-
lications, volumes 87 and 88.

INDEX

	<i>Paragraphs</i>	<i>Page</i>
Arctic operations-----	45	43
Bulk liquids. (See Terminals.)		
Bulk solids. (See Terminals.)		
Capacity. (See Inland waterways.)		
Cargo safety. (See Safety.)		
Coal. (See Terminals.)		
Communications and dispatching:		
Afloat-----	34	32
Ashore-----	35	32
Dispatching -----	36, 37	33, 34
Craft:		
Cargo-carrying-----	7	3
Harbor, used as inland waterway vessels-----	8	4
Inland waterway-----	6, 7	3
Fenders-----	53	47
General cargo. (See Terminals.)		
Harbor craft. (See Craft.)		
Indigenous personnel, employment of-----	31	27
Inland waterways:		
Capabilities-----	9	5
Capacity:		
Increasing-----	26	17
Tug or towboat requirements-----	25	16
Capacity computation formulas-----	24	15
Turn-around time:		
Definition-----	22	13
Formula-----	4	2
Definition-----	10	6
Inland waterway craft. (See Craft.)		
Inland waterways service:		
Mission-----	3	1
Operating units, functions of-----	32	29
Organization:		
Communications zone-----	13	8
Department of the Army-----	11	7
Lower echelons-----	13	8
Theater of operations-----	12	8
Relations:		
Military Sea Transportation Service-----	15	9
Other transport services-----	14	8

Inland waterways terminals. (See Terminals.)	Paragraphs	Page
Lookouts -----	43	42
Maintenance -----	67-69	54
Mechanical handling equipment -----	65, 66	33
Military Sea Transportation Service. (See Inland waterways service.)		
Mooring -----	52	47
Movement control -----	14	8
Personnel:		
Basic organization -----	28	20
Forming company organization -----	30	26
Operating units -----	29	22
Transportation inland waterways company -----	29, 30	22, 26
Pilot -----	38	35
Piloting -----	39, 40	35, 37
Planning:		
Advance:		
Necessary information -----	17	10
Sources of information -----	18	11
Concurrent -----	19	11
Planning factors -----	20	13
Purpose of text -----	1	1
Reconnaissance -----	21	13
Reports and records:		
Required -----	70	56
Miscellaneous -----	71	56
Rigging:		
Capstan -----	51	46
Hawser -----	47	45
Pull tow -----	50	46
Push tow -----	49	45
Safety:		
Station bills -----	72	56
Inflammable cargoes -----	73	57
Terminals:		
Bulk liquid:		
Contamination -----	61	51
Loading and discharging -----	60	51
Storage -----	59	50

Terminals—Continued

	<i>Paragraphs</i>	<i>Page</i>
Bulk solid:		
Coal, loading and discharging-----	63	52
Pulverized commodities-----	64	52
General cargo:		
Coastal port-----	56	49
Inland port-----	57	49
Typical requirements-----	58	50
Operations-----	33	31
Reports-----	33	31
Types-----	35	32
Types of cargo-----	33	31
Tows, types. (<i>See</i> Piloting.)		
Transportation inland waterways company. (<i>See</i> Personnel.)		
Turn-around time. (<i>See</i> Inland waterways.)		
Waterways. (<i>See</i> Inland waterways.)		

